APPENDIX F

DRAFT
Incorporation of Periodic Managed Recessions Into The Tentative Selective Plan For The Lake Okeechobee Regulation Schedule

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F.0 DRAFT INCORPORATION OF PERIODIC MANAGED RECESSIONS INTO THE TENTATIVE SELECTIVE PLAN (TSP)

F.1 INTRODUCTION

The hurricanes of 2004 and 2005 devastated the submerged aquatic vegetations (SAV) community in Lake Okeechobee. Experience from the managed recession of 2000 and scientific literature suggest that managed recessions are beneficial to stimulate regrowth of SAV and improve overall lake health. These reasons have led to the request for managed recessions to be included periodically in the new lake regulation schedule based upon the ecological successes of the 2000 managed recession.

F.2 EVENTS LEADING TO THE MANAGED RECESSION DECISION

The South Florida Water Management District (SFWMD) has documented that seven of the nine years between 1991 and 1999 resulted in high lake stages and impacted the ecology of Lake Okeechobee by allowing less light to reach the bottom of the lake, resulting in loss of submerged vegetation (*Chara, Potamogeton, Vallisneria).* Increased turbidity levels resulted in light limitation of bulrush (*Scirpus* sp.), which may have weakened the plants, making them more susceptible to uprooting by wind-driven waves (Steinman et al., 2002). Phosphorus concentrations increased in the nearshore regions, as phosphorus-rich sediments were transported from the central mud zone toward the littoral zone (Havens and James, 1999).

Internal waves within the Lake Okeechobee's water column spread the loose sediments from the center of the lake to shoreline areas, resulting in more turbid, nutrient-rich water reaching this sensitive area (Havens and James, 1999), where much of the lake's submerged plants and fish/wildlife habitat occur (Aumen and Wetzel 1995).

The loss of SAV threatened the survival of a multi-million dollar sport fishery, which previously had been documented to rely on this habitat (Furse and Fox, 1994). Thus, the decision to lower the water level in Lake Okeechobee was driven by a combination of political and environmental factors (Steinman et al., 2002).

After extensive discussion among scientists, resource managers, and concerned members of the public, a consensus was reached that unless a sustained period of a more moderate (i.e., at or below 13.0 ft) lake level was to occur, many of the ecological and societal values of the resource might be lost. Based on prior studies in Lake Okeechobee (Steinman et al. 1997, Havens and James 1999), consultation with outside experts, and the best professional judgment of scientists at the SFWMD, Florida Fish and Wildlife Conservation Commission (FFWCC), and the U.S. Army Corps of Engineers' (Corps) Waterways Experiment Station, it was concluded that if the lake level could be lowered to 13 feet for at least eight weeks, conditions would be favorable for reestablishing a healthy SAV community in Lake Okeechobee. An eight-week period was considered the minimum time necessary to allow plants to germinate and grow to a size that could tolerate deeper flooding. However, keeping the lake at about 13 feet from 1 June through 1 August was viewed as potentially difficult because it coincided with the wet season in South

Florida, when increased inflows to Lake Okeechobee normally cause water levels to increase rapidly (Steinman et al., 2002).

In addition to the ecology of Lake Okeechobee, any decision regarding the lowering of lake levels needs to consider the following potential impacts:

1) Altered salinity regimes due to lake discharges to the downstream estuaries;
2) Increased phosphorus loading from lake discharges to the Everglades; and
3) Risk of reduced water supply for agricultural, utilities, and the natural environment if conditions following the recession became drier than expected (Steinman et al. 2002).

F.3 IMPLEMENTATION OF THE 2000 MANAGED RECESSION

In 2000, the Governing Board of the SFWMD adopted Resolution No. 00-31, also known as the Shared Adversity Plan (SFWMD, 2000). Although this plan had the greatest potential to meet the desired ecological outcome for Lake Okeechobee, it also had the highest risk for impacting the estuaries, the Everglades, and water users surrounding and depending on the lake. As a consequence, the potential risks and adversity were shared among the stakeholders, resulting in its name. The Shared Adversity Plan was implemented immediately after adoption. Discharges to the east, west, and south continued for 27 days, at which point releases from the Lake Okeechobee were terminated on 21 May 2000.

F.4 RESULTS

F.4.1 Hydrology

The hydrologic goal of lowering water levels in Lake Okeechobee to 13.0 feet was met on 21 May 2000, ten days earlier than anticipated, due to the extremely dry conditions during the recession. The additional goal of maintaining water levels at or below 13.0 feet for eight weeks also was met, as the summer of 2000 was one of the driest on record in South Florida. The loss of water directly attributable to the managed recession was estimated to be approximately one foot with evapotranspiration accounting for the additional lost water. Lake levels continued to drop through the summer, as areas north of Lake Okeechobee experienced a severe hydrologic drought and provided no inflow.

F.4.2 Lake Okeechobee

Over the course of the 2000 summer, transparency in the water column increased from 0.08 - 0.12 inches to near 3.3 feet (near bottom) and phosphorus concentrations declined from about 60–70 μg/L to near 20–30 μg/L, in regions where SAV recovered (Havens et al. 2001). The number of sites with SAV increased from two sites (of 42) in April 2000 (just prior to the managed recession) to 23 sites in August 2000. Low lake stages allowed the removal of an organic berm that had formed along the northwest (NW) marsh of the shore. Over five and a half miles of accumulated vegetative debris which accumulated from years of high lake stages was mechanically removed by earth-moving equipment and consolidated by the FFWCC in several wildlife islands in the lake.

A lake survey was conducted in October 2000 for presence–absence of SAV (Havens et al., 2002). Based on this survey, it was estimated that SAV covered greater than (>) 42,000 acres in Lake Okeechobee. This is similar to the spatial extent documented in a survey of the SAV in 1989–1991, coincident with another severe drought and low lake stage (Zimba et al., 1995). Although a comparable survey was not conducted prior to the managed recession in 2000, SAV cover in October 1999 was no more than 30,000 acres. Additional environmental responses to the recession can be found in Havens et al. (2001) and Steinman et al. (2002).

Monitoring of invasive species suggested that torpedograss continued to expand its cover in the littoral zone of Lake Okeechobee. Sampling of plant densities in reference plots that had been monitored since 1999 indicated that during the drought period, the rate of expansion of torpedograss increased by two- to threefold. However, the drought also provided dry conditions that allowed the SFWMD and coordinating agencies to carry out controlled fires and treatments of torpedograss with herbicide. These treatments continued through 2001, and as of July 2002, treated areas were not displaying significant regrowth of torpedograss.

F.4.3 Estuaries

Monitoring conducted as part of the managed recession revealed results consistent with prior research at the SFWMD, which indicated that short-term releases of water can have immediate, negative impacts, but that these systems are resilient (Doering et al., 1999, Kraemer et al., 1999). Once discharges to the St. Lucie Estuary ceased, turbidity subsided within four days and salinity returned to ranges tolerable to oysters within one week. Impacts to seagrasses along the Atlantic coastline were localized and did not persist past June 2000. Recovery of environmental conditions was slower in the Caloosahatchee Estuary because there was seagrass mortality in the lower estuary. A cyanobacterial bloom (Anabaena spp.) was documented in the upper estuary, presumably related to the recession operation. A working hypothesis is that the water from Lake Okeechobee "seeded" the estuary with cyanobacteria, which then proliferated to bloom levels in a subsequent period when flow was maintained at near 300 cubic feet per second (cfs) for a number of weeks, keeping conditions oligohaline. This low flow rate maintained an isohaline front near the city of Fort Myers. The bloom ended when freshwater discharges were stopped and salinity levels began to increase.

F.4.4 Everglades

Impacts of the managed recession on the Everglades were minimal. There was no apparent impact on tree islands as a result of the Shared Adversity Plan. In addition, the year 2000 turned out to be one of the most successful nesting seasons in several decades for wading birds in the Everglades as a whole (SFWMD, 2001). Because the managed recession took place late in the spring, much of the nesting season was already completed and not impacted by the releases. Flow sampling during the recession revealed that relatively little canal-to-marsh water exchange occurred, because many of the marsh water levels were below land surface. There were no apparent water quality impacts, as determined from phosphorus sampling in the marshes and canals during the course of the recession.

F.4.5 Water supply

Contrary to model predictions, the region experienced a serious drought, and severe water restrictions were imposed on all water users throughout South Florida. This ranged from substantial cutbacks on agricultural users to restrictions on use of home sprinklers and car washing. The managed recession accounted for approximately one foot of lost water on the lake (with > five feet subsequently lost to evapotranspiration and water deliveries), so it is likely that these restrictions would have taken place regardless of whether or not the recession had been approved. However, it is unknown how the managed recession may have affected the initiation date or duration of these restrictions. Although normal to above-normal precipitation returned to South Florida in the fall of 2001, thereby abating the water shortage crisis, the restrictions during 2000–2001 resulted in economic hardships throughout the region. Not only were there water use restrictions in the South Florida region, but also economic impacts were felt by citrus, rice, and other agricultural industries, bait shop owners, hotel operators, fishing guides, trailer parks, and other segments of the economy integrally linked to public use of the lake resource. During the drought, a state of emergency was declared, allowing small-business owners to apply for low-interest loans. The main users of these loans were the commercial seine-fishing operators, who were not able to do any fishing when lake stage levels were low (SFWMD, unpublished data).

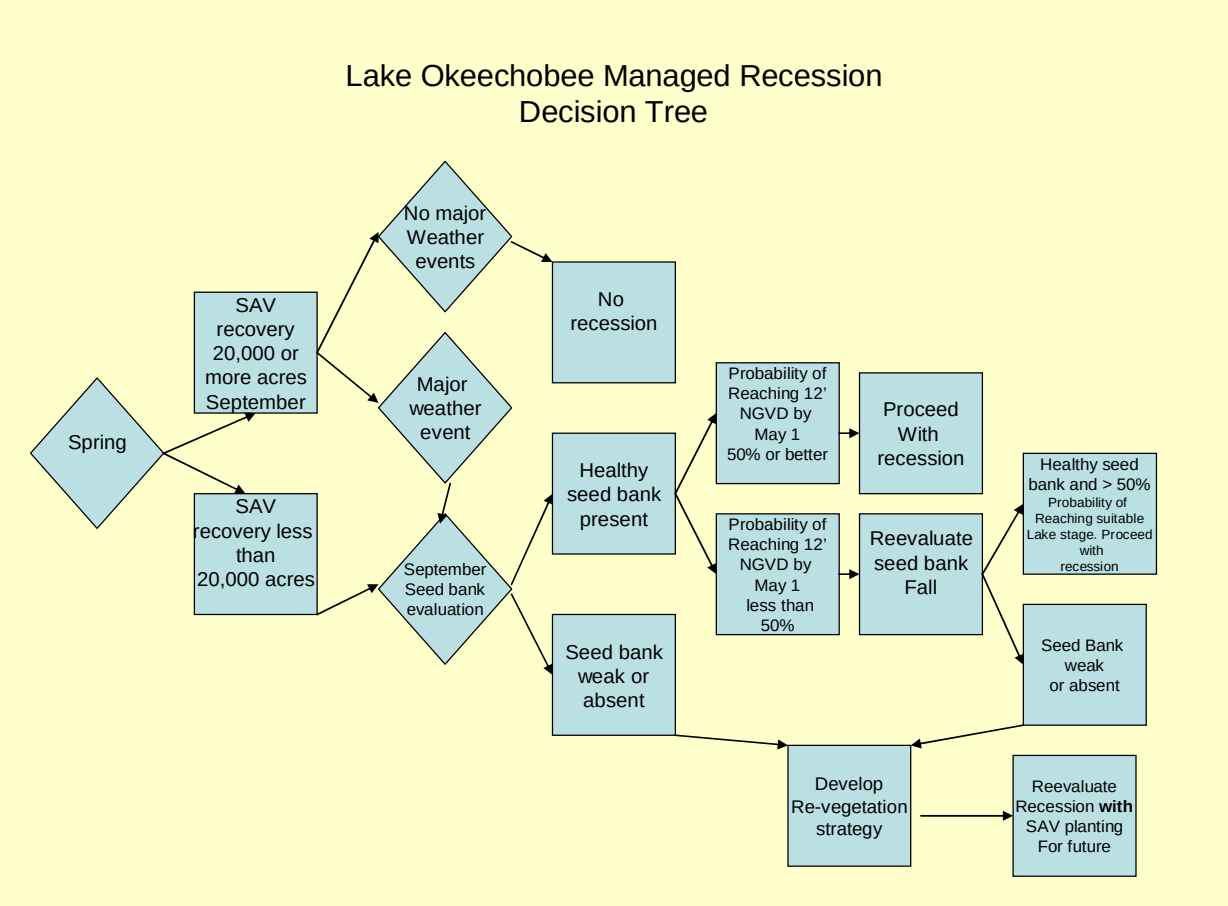
An attempt to initiate another managed recession was undertaken during late Fall 2005, since lake levels significantly raised following the passing of the 2004 and 2005 hurricanes, and ecological hardships followed. Based on lessons learned from the 2000 managed recession, the following decision tree summarizes the planning process that was being considered for implementation in spring 2006, and would be considered for future periodic recessions.

F.5 ADDITIONAL CONSIDERATIONS

The decision to implement managed recessions during the period covered by the new regulation schedule is contingent on several factors, including climatic conditions and lake health. Each occurrence would need to be addressed on an individual basis depending on existing conditions and the resulting ecological evaluation. These factors will include determining:

- the lake stage that is presumed to improve the lake health.
- whether the stage target can be reached.
- whether attempting to reach the stage target will adversely affect other ecosystems or water supply.
- potential impacts to the Lake Okeechobee levee.
- what would be the stage thresholds that, if exceeded, should trigger discontinuation of the managed recession.
- Are the potential benefits to Lake Okeechobee, worth the potential cost?

Based on the actual, as opposed to the planned, scope of the 2000-2001 drawdown and drought; lake bathymetry, minimum flows and levels (MFL) considerations, and the time it took for a measurable SAV response to occur, it is recommended that the managed lake recessions that are incorporated into the new regulation schedule should have as a target a lake stage of 12 ft., National Geodetic Vertical Datum (NGVD) and a duration of 12 weeks


Lake Okeechobee Managed Recession
Decision Tree
Spring
SAV recovery 20,000 or more acres September
SAV recovery less than 20,000 acres
No major Weather events
Major weather event
September Seed bank evaluation
No recession
Healthy seed bank present
Seed bank weak or absent
Probability of Reaching 12' NGVD by May 1 50% or better
Probability of Reaching 12' NGVD by May 1 less than 50%
Proceed With recession
Reevaluate seed bank Fall
Healthy seed bank and > 50% Probability of Reaching suitable Lake stage. Proceed with recession
Seed Bank weak or absent
Develop Re-vegetation strategy
Reevaluate Recession with SAV planting For future

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